A NEW FAMILY OF HEMIPTERA-HETEROPTERA PROPOSED FOR MACROVELIA HORNII UHLER

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The water striding families and their close relatives have been variously treated as *Ploteres* Latreille, *Amphibicorises* Dufour, *Hydrometrites* Laporte, and *Veliens* Brullé. The families Gerridae and Veliidae have always been considered as a closely related unit and the Hydrometridae, with apical claws, has been associated with them by most workers. The relationships of the Mesoveliidae and Hebridae are less clear, the former being allied to the Gerroideae by Reuter (1910) while the Hebridae, because of their "arolia," were placed in a separate superfamily.

Recent studies on the shape of the "mandibular levers" by Ekblom (1929) and on the male genitalia by Singh-Pruthi (1925) firmly establish the unity of these apparently divergent groups. More recently Lundblad (1939) reviewed the characters of the various families in an attempt to place an anomalous south African species. Lundblad found it necessary to erect a new family midway between the Hebridae and the Veliidae. This and other annectent forms provide further evidence of the unity of the group. Indeed, the family characters become so shuffled about that it becomes difficult to decide where one family begins and another ends.

Nearly 70 years ago, Uhler described the genus *Macrovelia* with one species *hornii*. That is still the only species included in the genus. This monotypic genus was placed in the family Veliidae where it has remained despite the fact that it disagrees in most fundamental characters with that family. For example, it has apical claws and is quite helpless upon the surface of the water, it has well developed ocelli and has a large, median metasternal scent gland. Actually, *Macrovelia* is an even more remarkable annectent type than Lundblad's *Hebrovelia*. Its characters are such that we are left with no alternative but to erect a new monotypic family.

The author wishes to express his appreciation to William E. Hoffmann who suggested the group for study, to H. G. Barber for the loan of specimens of *Mesoveloidea* Hungerford, to E. S. Ross for the loan of specimens from the California Academy of Sciences, and to R. L. Usinger for inspiration and many helpful suggestions.

MACROVELIIDAE McKinstry, new family

Form narrowly elongate, flat across wings, pronotum convex, head cylindrical, venter convex. *Head* narrowed between eyes, thickening posteriorly. Two ocelli present, set slightly closer to compound eyes than to median line, and slightly forward of mid point of eyes. Ocelli pointing forward and slightly outward on semi-cylindrical raised areas, disappearing posteriorly. Three pairs of trichobothria arising on dorsum near occiput, slightly anterior and laterad to ocelli, and at base of beak respectively. Third segment of beak about three times as long as fourth. First and second segments one-third or less than length of fourth segment. Basal third of third segment somewhat enlarged, narrowing again for insertion into second segment. Proportion of third segment and length of segments resembling those characters of the beak of *Mesovelia* rather closely. Antennae arising a little ventrally and anteriorly to compound eyes, near base of beak. Ventral portion of head with raised area directly under beak, striated transversely. Base of beak set deeply between two lateral, subgenal plates. Neck narrower than posterior swelling of head, set lightly into prothorax, head often extruded in pinned specimens showing small area of neck. Antennae four segmented with segments three and four showing minute diagonal striations for about half their length midway between the ends of each segment, clothed with short irregular bristles, longer on basal segment, decreasing toward distal segments.

Pronotum with distinct collar, marked with distinct pits dorsally and laterally, continuing slightly ventrally. Prosternum very shallowly concave under beak. Meso and metaterga (dissected specimens) distinctly divided by narrow membranous area. Posterior margin of mesoscutellum transverse, extending anteriorly at 45 degree angle for about one-fourth of the posterior margin on each side. Metatergum divided into three distinct areas, consisting of a larger median triangular area with base anteriorly and apex not sharply pointed at posterior margin of metatergum. Laterad of median triangular area is a more heavily sclerotized area,

also triangular, with inner margins heavily sclerotized and raised. Seven trichobothria visible in lateral triangular area. A longitudinal, semi-cylindrical area arising higher than other areas on lateral margin of metathorax. All three areas fused together. Meta and mesosterna with distinct transverse suture between them. Beak extending between the midpoint of mesosternum and posterior margin, depending on the angle of the head. Mesosternum shallowly concave under beak. Metasternum swelling toward median posterior point where scent gland opens under semicircular projection of sternum. *Abdomen* loosely connected to thorax above, fused on venter. Six distinct abdominal segments visible ventrally, the first segment reduced as in other Hemiptera. Lateral portion of connexivum fused with sternum but fairly well marked. Spiracles in regular row along ventral portion of connexivum midway between sutures. Dorsal plates of connexivum distinctly separated from medio-tergal plates by longitudinal sutures. First four sclerites of both connexivum and tergum fused. Two large distinct pits on fused portion of connexivum probably corresponding to area between segments 2 and 3, and 3 and 4 respectively. Another pair of pits present on anterior-lateral corners of tergum. Terga of first four segments ridged longitudinally on each side of median line about half way between median line and edge of tergum, forming with transverse ridges on fused segmental lines a series of semi-rectangular areas, one on each segment. Various pits suggestive of trichobothrial pits on lateral areas of first and second tergites and median rectangle of first tergite. Two pairs of very distinct trichobothria on 6th and 7th tergites near anterior margin of those segments. One scent gland opening near anterior margin of 4th tergite on median line.

Legs proportioned much the same as *Velia* and *Microvelia*, with front pair shortest, hind pair longest, but not unusually elongated. Front femora only slightly thicker than others. All tarsi three segmented, first segment much reduced but distinct, second segment of front tarsi nearly equal to distal segment, second segment of middle tarsi slightly longer, and second segment of hind tarsi nearly twice as long as distal segment. Tarsal claws two, and apical. Hind coxae about one and one-half times as long as others.

Front wings with costal area consisting of one vein considerably thickened at apex which extends about two-thirds of length of wing. This vein is split at base forming a narrow, almost indistinct cell (not included in count of closed cells). Two more longitudinal veins arise from base and with cross veins and branches, form six closed cells, the most characteristic being the boot-shaped cell lying with heel and back of leg along costal thickened margin, about midway between base and apex. On posterior margin between actual margin of wing and posterior longitudinal vein about midway between base and apex of wing is a thickened spot about

the width of a vein. *Hind wings* with three longitudinal veins, only one closed cell, another nearly closed, basal portion of first and third longitudinal veins thickened and darkened.

Type genus: *Macrovelia* Uhler, 1872.

Macrovelia occupies an isolated position not only taxonomically but also geographically. It apparently is confined to the western part of North America. Specimens before me, most of which were borrowed from the California Academy of Sciences, are from the following regions:—California: Sequoia National Park; Siskiyou County; Lagunitas, Marin County; Pine Canyon, Mt. Diablo; Cayton, Shasta County; Willow Creek, Humboldt County; Sonora; Mark West Springs; Angels Camp; Oroville; Trinity County; Murphys, Calaveras County; Fort Bragg; Cazadero; Bryson Canyon, Monterey County; Fairfax, Marin County; Redwood Canyon, Contra Costa County; Michigan Bar, Sacramento County; Leona Heights, Alameda County; Santa Clara County; Folsom, Sacramento County; Carmel; Mokelumne Hill, Calaveras County; Napa County. Brachypterous specimens are at hand from the following localities:—California: Siskiyou County; Lagunitas, Marin County; Cayton, Shasta County; Pine Canyon, Mt. Diablo; Trinity Center, Trinity County; Leona Heights, Alameda County; and a specimen from the E. P. Van Duzee collection labeled Colorado. Dr. R. H. Beamer, University of Kansas, tells me that specimens were taken in the Dakotas. Previous literature records *Macrovelia* from Colorado, New Mexico, Arizona, and California.

Collecting experience indicates that the best places to collect *Macrovelia* are foothill areas or low ranges where there is an abundance of moss, down deciduous timber and a small stream of water such as a spring which is constant in flow throughout the year. Most specimens were secured by tearing off pieces of bark and beating them into a net. However, specimens were taken at the waters edge in moss and debris and even swept from ferns growing over the water, but never over five feet from the edge of the water. None was observed to run upon the water voluntarily, nor did any specimens leave their places of hiding. They were practically helpless when placed upon the water, the hind legs soon penetrating the surface film. When they were extricated

and cleaned a few more steps could be taken and the process had to be repeated.

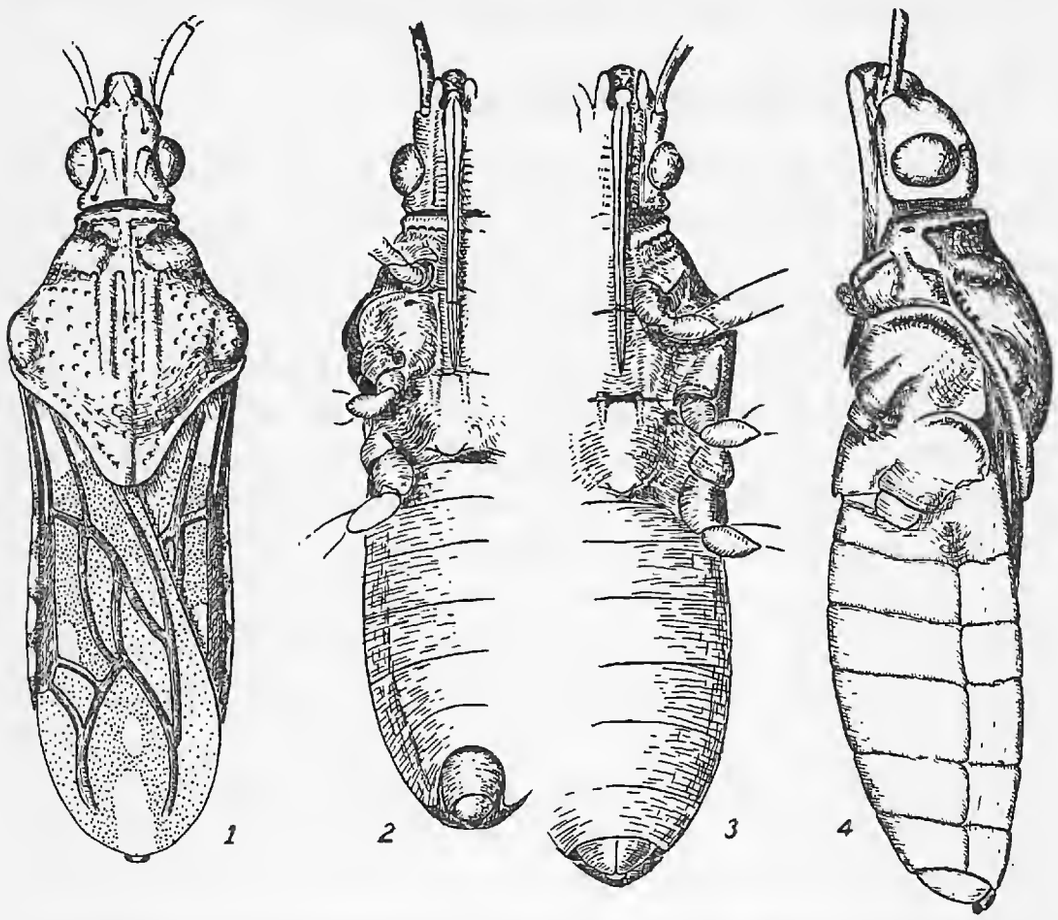


Figure 1. *Macrovelia hornii* Uhler, dorsal view. Figures 2, 3, and 4, same, ventral view of male, ventral view of female, and lateral view of female.

The differences between the Macroveliidae and the Veliidae are summarized below:

VELIIDAE	MACROVELIIDAE
1. No ocelli.	1. Two ocelli.
2. Ante-apical claws.	2. Apical claws.
3. Thoracic scent glands lateral, near hind coxae.	3. Thoracic scent gland median, ventral, well developed.
4. Dorsal abdominal scent gland lacking.	4. Dorsal abdominal scent gland present, distinct.
5. Four closed cells in front wing.	5. Six closed cells in front wing.

Superficial similarities between the two families may be summarized as follows:

1. Legs proportioned about the same as *Velia* and *Microvelia.*
2. Prothorax of winged forms quite similar.
3. Ovipositors of the same type.

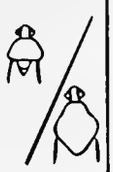
4. Colors similar.

5. Antennae appearing much the same.

Actually the family Macroveliidae is much closer to the Hebridae than to any other family, but the Hebrids have both a mesothoracic and a metathoracic scutellum showing behind the pronotum, a prominent rostral groove and bucculae, and entirely different venation of front wings.

A summary of the family characters for the surface water bugs, Amphibicorisae, is given below, followed by a discussion of each character.

TABLE OF FAMILY CHARACTERS OF AMPHIBICORISAE

Winged Forms	Scutellum 	Claws: Apical	Claws: Pre-apical	Thoracic Scent Glands: Median	Thoracic Scent Glands: Lateral	Abdominal Scent Glands	Ocelli: Present	Ocelli: Absent	Closed Cells in Fore Wing: 1 2 3 4 6	Number Tarsal Segments	Arolial Bristles: Present	Arolial Bristles: Absent	Ovipositor For Piercing Tissues
Hebridae	X	X		X		Present	X		1	222	X		-
Mesoveliidae	X	X		X		Present	X		3	333	X		Present
Macroveliidae	X	X		X		Present	X		6	333	X		-
Hebroveliidae	X	X		?		Absent		X	5	122	X?		?-
Hydrometridae	X	X		None		Absent		X	2	333	X		-
Gerridae	X		X	X		Absent		X	4	222	X		-
Veliidae	X		X		X	Absent		X	4	122 and 333	X		-

1. *The Thorax:* We will deal with fully developed or winged forms only. In all but three of the known types of Amphibicorisae, the pronotum covers all of the dorsal area of the thorax which is not covered by wings. *Macrovelia* resembles the Veliidae in this respect, but the Gerridae and Hydrometridae are also of this pattern. The Mesoveliidae and Hebridae have both the scutellum of the mesothorax and the scutellum of the metathorax showing beyond the pronotum.

2. *The Claws:* The Veliidae and Gerridae (? *Eotrechus* Kirk.) have claws originating at a point before the apex of the tarsus. Other families are normal with claws at the apex of the tarsus. *Macrovelia* has apical claws.

3. *Arolial Bristles:* In his classification of the Hemiptera, O. M. Reuter (1910) placed great emphasis upon certain structures

originating between the claws. Reuter considered that these so-called "arolia" were present in the Hebridae and absent in other Amphibicorisae. In the present study cleared slide mounts were made of all the families including the Hebridae. In all cases, two bristles were observed coming from a central pad which is in turn fastened to a tendon running up into the tarsus. The bristles in the Hebridae were as long as the claws, which accounts for their being seen first. Bristles in the other forms were shorter. No structures comparable to the lateral or basal pseudarolia (Knight, 1924) were seen in these bugs.

4. *Scent Glands:* In general these structures are difficult to see in pinned specimens. However, in the Veliidae the scent glands near the bases of the hind coxae are conveniently marked by tufts of bristles while Gerridae apparently lack these lateral scent glands but possess a single more or less distinct opening at the middle of the metasternum. This has been termed the omphalium and is characteristic of all Amphibicorisae except the Veliidae and most Hydrometridae (? *Limnobatodes* Hussey).

5. *Wing Venation:* The number of veins and shape of cells tend to break down as constant characters (in the Veliid, *Perittopus* Fieber, for example) but certain types are easily recognized. The number of closed cells is a rough way of classifying wing venation, serving merely to indicate a difference in type on the tabulation of characters included in this paper.

6. *Ovipositors:* Only the Mesoveliidae show development of the ovipositor for penetration of plant tissue. The reduced ovipositor in *Macrovelia* prevents its inclusion in the Mesoveliidae, although they are alike in tarsal claws and in ocellar structure.

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